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# Prevalence and awareness level of temporomandibular joint dysfunction among undergraduate and graduate dentistry students

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## ABSTRACT

**Aims:** The aim of this study is to investigate the presence and prevalence of temporomandibular joint dysfunction (TMD) among undergraduate and graduate dentistry students, as well as their awareness of TMD.

**Methods:** After the study details and research questions were explained to the volunteer participants, survey forms were distributed. Participants were instructed not to write their names on the forms, which were collected in random order. The survey included the Fonseca anamnestic index, translated into Turkish by the researchers, along with additional demographic questions. Responses were analyzed using descriptive statistics, the Chi-square test, or the Fisher exact test. Differences between groups were determined with Dunn's Bonferroni test. p-values below 0.05 were considered statistically significant.

**Results:** According to the Fonseca Anamnestic Index, there is a significant association between TMD and gender. The rate of severe TMD in females (96.77%) was found to be significantly higher than in the mild TMD and no TMD groups. A significant relationship was also observed between class level and TMD (p=0.023); however, this difference is attributable to graduate students. Moderate TMD (26.25%) and severe TMD (25.81%) levels were higher among graduate students compared to the no TMD group (8.94%). No significant association was found between living arrangements (living with family or alone) and TMD. Additionally, no relationship was established between the department in which graduate students were enrolled and the presence of TMD.

**Conclusion:** This study conducted with undergraduate and graduate dentistry students primarily highlights the relationship between TMD, gender, and class level. The findings suggest a high level of TMD awareness and motivation for treatment among participants. The study did not establish a relationship between class level and TMD at the undergraduate level, nor between the department of study and TMD at the graduate level.

**Keywords:** Temporomandibular joint dysfunction, dentistry students

## INTRODUCTION

The temporomandibular joint (TMJ) is defined as the area where the mandible articulates with the temporal bone at the base of the skull. TMJ is one of the most complex joint in the body. Since this joint allows hinge movements in one plane, it is considered a ginglymoid joint. However, it also permits gliding movements, classifying it as an arthrodial joint. Therefore, it is technically regarded as a ginglymoarthrodial joint. The TMJ is formed by the mandibular condyle fitting into the mandibular fossa of the temporal bone. The articular disc, a structure that separates these two bones from directly articulating, forms the joint. The TMJ is classified as a compound joint. By definition, a compound joint requires the presence of at least three bones, but the TMJ consists of only two bones. Functionally, the articular disc serves as a non-ossified bone that allows for the joint's complex movements. Since the articular disc functions as a third bone, the craniomandibular joint is considered a compound joint.[1]

Temporomandibular joint dysfunction (TMD) is a general term used for a group of musculoskeletal disorders characterized by pain and/or dysfunction in the masticatory muscles, TMJ, and associated structures, commonly seen in young adults and the middle-aged population.[2] TMD is one of the primary causes of chronic pain in the orofacial region.[3] Epidemiological studies indicate that 75% of adults display at least one sign of dysfunction upon examination, and one-third present with a symptom. However, it is noted that only 5% of adults with TMD symptoms require treatment.[4]

According to a meta-analysis by Valesan et al.,[5] the general prevalence of TMD is approximately 31% among adults/

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elderly and 11% among children/adolescents. Additionally, the most common TMD is disc displacement with reduction, seen in approximately 26% of adults/elderly and 7.5% of children/adolescents. Patients with TMD, symptoms are mostly observed between the ages of 20 and 40.[6] Among the young population, TMD symptoms are four times higher in females than in males.[7] Symptoms of TMD include restricted mandibular movements, pain in the masticatory muscles, TMJ pain, joint sounds during function, widespread myofascial pain, and limitations in mouth opening, as well as locking or deviation.[8]

The etiology of TMD is uncertain and is often multifactorial,[9] involving various physical and psychosocial factors.[10] Some of these factors include capsular inflammation or injury, muscle pain, abnormal occlusion, parafunctional habits, stress, anxiety, or abnormalities of the intra-articular disc.[9]

### Diagnosis of TMD

The diagnosis of TMD generally involves detailed anamnesis and physical examination methods.[6] Although various imaging techniques, such as conventional radiography (transcranial plain radiograph in open and closed mouth positions), panoramic mandibular radiography, ultrasonography, computed tomography, magnetic resonance imaging (MRI), and radionuclide imaging techniques can be used for diagnosis, MRI is considered the gold standard for imaging the disc and other structures.[11]

### Treatment of TMD

TMD treatment can be classified into definitive and supportive therapies. While definitive treatments aim to eliminate the etiology, supportive treatments focus on reducing symptoms. The goals of treatment include eliminating etiological and pathological factors, reducing symptoms, restoring joint mobility, and improving posture. Initial treatment for TMD involves simple approaches such as patient education, a soft diet, reduction of parafunctional habits, physical therapy, medical treatment, improvement of sleep quality, and the use of occlusal splints.[12,13] In advanced cases, surgical treatments may be required as a non-conservative approach.

In 1992, Fonseca modified Helkimo's indexes and developed an anamnesic questionnaire to classify TMD symptoms.[14] This questionnaire consists of 10 questions that screen for pain in the TMJ, head, and back regions; pain during chewing; parafunctional habits; movement restrictions; joint sounds; perceived malocclusion; and feelings of emotional stress.[15] This index is a simple, easy, and low-cost tool to indicate TMD symptoms in a non-patient population, making it a useful pre-screening tool for TMD.[16]

The aim of this study is to assess the presence of TMD and evaluate TMD awareness among undergraduate students at the faculty of dentistry and doctoral students in the field of dentistry at the Institute of Health Sciences at Başkent University using the Fonseca Anamnesic Questionnaire.

## METHODS

The study was approved by the Ethics Committee for Clinical Researches of Başkent University (Date: 22.11.2024, Decision No: 24/229). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Written and verbal informed consent was obtained from the volunteers after they were informed about the study and agreed to participate.

This study was administered among undergraduate students from the Faculty of Dentistry and graduate students from the Institute of Health Sciences at Başkent University. A total of 407 voluntary participants, consisting of 288 females and 119 males, took part in the study. The age range of participants varied between 18 and 28. The students were divided into two groups: undergraduate and graduate. Subsequently, they were further categorized into subgroups based on their academic year: undergraduate students (1st, 2nd, 3rd, 4th, and 5th years) and graduate students (<2 years, >2 years). Volunteers were informed about the study's objectives, risks, and benefits. The survey was designed using Google Forms and distributed to participants through digital platforms. Data collection was conducted electronically. Responses with inconsistencies, multiple selections for single-choice questions, or missing answers were excluded from the study.

Participants were asked to complete a questionnaire consisting of two main sections. The first section included questions on demographic information and TMJ history. In the second section, participants answered Fonseca's 10-question survey, which covers factors such as chewing, parafunctional habits, movement limitations, and joint sounds. The questionnaire was translated into Turkish by the researchers. Each question offered three response options: "yes," "no," and "sometimes." Participants were instructed to mark only one option per question, with "yes" responses scoring 10 points, "sometimes" responses scoring 5 points, and "no" responses scoring 0 points. The Fonseca Anamnesic Questionnaire, reported as a valid and reliable tool, was used to determine the severity of TMJ disorders.[17,18] The questionnaire score was totaled, and TMD severity was classified based on the total score:[18] no TMD (0-15 points), mild TMD (20-40 points), moderate TMD (45-65 points), and severe TMD (70-100 points) (Table 1).

**Table 1. Fonseca Anamnestic Questionnaire questions**

| Question | Yes (10 points) | No (0 points) | Sometimes (5 points) |
|---|---|---|---|
| Do you have difficulty opening your mouth wide? | | | |
| Do you have difficulty moving your lower jaw sideways? | | | |
| Do you experience fatigue/pain in your muscles while chewing? | | | |
| Do you frequently have headaches? | | | |
| Do you experience neck pain or stiffness? | | | |
| Do you have pain in your ear or jaw joint? | | | |
| Have you ever heard any clicking sound from your jaw joint during chewing or mouth opening? | | | |
| Do you have a habit of clenching or grinding your teeth? | | | |
| Do you feel that your teeth do not come together properly? | | | |
| Do you consider yourself a tense (nervous) person? | | | |

(Classification of TMD severity by anamnestic index: 0-15 points = No TMD; 20-40 points = Mild TMD; 45-65 points = Moderate TMD; 70-100 points = Severe TMD) TMD: Temporomandibular joint dysfunction

In addition to the Fonseca Anamnesic Questionnaire, nine questions prepared by the researchers were asked to determine the participants' awareness of TMD and to gather demographic information:

- What is your gender?
- Which year are you currently studying in?
- Do you live with your family or alone?
- Do you have any knowledge about TMJ and muscle disorders?
- Do you think you have a temporomandibular joint or muscle disorder?
- If present, are you considering treatment?
- What is your doctoral studies department?
- How many years have you completed in your graduate studies?
- How many hours do you work per day?

### Statistical Analysis

Statistical analyses were performed using SPSS (Statistical Package for Social Sciences) software, version 25.0. Descriptive analyses included mean, standard deviation, median, minimum, and maximum values. For categorical variables, frequencies and percentages were used. Relationships between categorical variables were examined using the Chi-square test or Fisher exact test. Differences between groups were determined by Dunn's Bonferroni test. p-values below 0.05 were considered statistically significant.

## RESULTS

A total of 407 individuals voluntarily participated in this study, of whom 288 (70.76%) were female and 119 (29.24%) were male. Among the participants, 83.78% (n=341) were undergraduate students, while 16.22% (n=66) were graduate students. The class levels of the undergraduate students, the departments in which the graduate students are pursuing their doctorates, their educational degrees, and study durations are presented in Table 2.

**Table 2. Descriptive statistics of undergraduate and graduate students**

| | | n | % |
|---|---|---|---|
| **Year of study (undergraduates, n=341)** | 1 | 96 | 28.15 |
| | 2 | 88 | 25.81 |
| | 3 | 95 | 27.86 |
| | 4 | 35 | 10.26 |
| | 5 | 27 | 7.92 |
| **Doctoral program (graduate students)** | Prosthodontics | 28 | 42.42 |
| | Periodontology | 13 | 19.70 |
| | Endodontics/restorative dentistry | 9 | 13.64 |
| | Oral and maxillofacial surgery | 16 | 24.24 |
| **Year of graduate study** | <2 | 33 | 50.00 |
| | >2 | 33 | 50.00 |
| **Hours worked per day** | 9 hours | 38 | 57.58 |
| | 9-12 hours | 16 | 24.24 |
| | 12+ | 12 | 18.18 |

The mean score for TMD among undergraduate and graduate students was calculated as 31.73±21.50. The proportions of mild and moderate TMD were 42.51%, and 19.66% respectively. Severe TMD was observed in 7.62% of participants (Table 3).

**Table 3. Distribution of TMD severity**

| | Mean score (31.73±21.50) | n | % |
|---|---|---|---|
| **TMD** | No TMD | 123 | 30.22 |
| | Mild TMD | 173 | 42.51 |
| | Moderate TMD | 80 | 19.66 |
| | Severe TMD | 31 | 7.62 |

TMD: Temporomandibular joint dysfunction

There was a significant association between TMD and gender among undergraduate and graduate students (p<0.001). In females, the rates of severe TMD (96.77%) and mild TMD (70.52%) were significantly higher compared to the no TMD group (60.98%) (p=0.012 and p=0.001, respectively). In males, the rates of severe TMD (3.23%) and mild TMD (29.71%) were significantly lower than those without TMD group (38.89%). While mild and moderate TMD levels were similar between males and females, the rate of severe TMD was significantly higher in females (10.42%) than in males (0.84%) (p=0.001). A significant relationship was also found between class level and TMD (p=0.023). However, this difference was attributable to graduate students. Among graduate students, the levels of moderate TMD (26.25%) and severe TMD (25.81%) were higher compared to than those without TMD group (8.94%). The rate of severe TMD (90.32%) was significantly higher among those who answered "yes" to the question "Do you have any knowledge about TMJ and muscle disorders?" compared to other TMD groups (p<0.001; p<0.001; p=0.024, respectively). Similarly, the rates of mild and moderate TMD were higher than in those without TMD group (p<0.001). Among those who responded "yes" to the question "Do you think you have a temporomandibular joint or muscle disorder?" TMD severity increased at all levels, with a statistically significant increase observed in moderate and severe TMD levels (p<0.001) (Table 4).

There was a significant association between TMD and gender among graduate students (p=0.038). The rate of severe TMD in females (100%) was significantly higher compared to the no TMD group (36.36%). In males, the rate of severe TMD (0%) was significantly lower than in the no TMD group (63.64%). While mild and moderate TMD levels were similar between males and females, the rate of severe TMD was significantly higher in females (20.51%) than in males (0%). Among those who responded "yes" to the question "Do you think you have a temporomandibular joint or muscle disorder?" moderate and severe TMD levels were significantly higher (p<0.001) (Table 5).

## DISCUSSION

This study have provided the presence and severity of TMD and assesses the level of awareness about TMD among students enrolled in undergraduate and graduate degrees in dentistry. The Fonseca anamnestic questionnaire was used to explore the presence and severity of TMD.

The responses to the questionnaire in our study were consistent when other studies were regarded. Studies that

**Table 4. Relationship between TMD and parameters among undergraduate and graduate students**

| | | TMD | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No TMD | | Mild TMD | | Moderate TMD | | Severe TMD | | |
| | | n | % | n | % | n | % | n | % | p value |
| **Gender** | Female | 75 | 60.98 | 122 | 70.52 | 61 | 76.25 | 30 | 96.77 | <0.001 |
| | Male | 48 | 39.02 | 51 | 29.48 | 19 | 23.75 | 1 | 3.23 | |
| **Year of study** | 1 | 34 | 27.64 | 44 | 25.43 | 15 | 18.75 | 3 | 9.68 | 0.023 |
| | 2 | 32 | 26.02 | 38 | 21.97 | 13 | 16.25 | 5 | 16.13 | |
| | 3 | 28 | 22.76 | 45 | 26.01 | 14 | 17.50 | 8 | 25.81 | |
| | 4 | 11 | 8.94 | 12 | 6.94 | 7 | 8.75 | 5 | 16.13 | |
| | 5 | 7 | 5.69 | 8 | 4.62 | 10 | 12.50 | 2 | 6.45 | |
| | PG | 11 | 8.94 | 26 | 15.03 | 21 | 26.25 | 8 | 25.81 | |
| **Living situation** | Alone | 64 | 52.03 | 88 | 50.87 | 29 | 36.25 | 17 | 54.84 | 0.098 |
| | With family | 59 | 47.97 | 85 | 49.13 | 51 | 63.75 | 14 | 45.16 | |
| **Knowledge of TMJ and muscle disorders** | Yes | 82 | 66.67 | 116 | 67.05 | 62 | 77.50 | 26 | 83.87 | 0.095 |
| | No | 41 | 33.33 | 57 | 32.95 | 18 | 22.50 | 5 | 16.13 | |
| **Self-perceived presence of TMJ disorders** | Yes | 2 | 1.63 | 30 | 17.34 | 50 | 62.50 | 28 | 90.32 | <0.001 |
| | No | 121 | 98.37 | 143 | 82.66 | 30 | 37.50 | 3 | 9.68 | |
| **Considering treatment** | Yes | 28 | 22.76 | 63 | 36.42 | 43 | 53.75 | 22 | 70.97 | <0.001 |
| | No | 95 | 77.24 | 110 | 63.58 | 37 | 46.25 | 9 | 29.03 | |

Chi-square test, TMD: Temporomandibular joint dysfunction, TMJ: Temporomandibular joint

**Table 5. Relationship between TMD and parameters among graduate students**

| | | TMD | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No TMD | | Mild TMD | | Moderate TMD | | Severe TMD | | |
| | | n | % | n | % | n | % | n | % | p value |
| **Gender** | Female | 4 | 36.36 | 15 | 57.69 | 12 | 57.14 | 8 | 100.00 | 0.038 |
| | Male | 7 | 63.64 | 11 | 42.31 | 9 | 42.86 | - | - | |
| **Living situation** | Alone | 8 | 72.73 | 20 | 76.92 | 9 | 42.86 | 4 | 50.00 | 0.083 |
| | With family | 3 | 27.27 | 6 | 23.08 | 12 | 57.14 | 4 | 50.00 | |
| **Knowledge of TMJ and muscle disorders** | Yes | 11 | 100.00 | 24 | 92.31 | 21 | 100.00 | 8 | 100.00 | 0.745 |
| | No | - | - | 2 | 7.69 | - | - | - | - | |
| **Self-perceived presence of TMJ disorders** | Yes | - | - | 11 | 42.31 | 21 | 100.00 | 8 | 100.00 | <0.001 |
| | No | 11 | 100.00 | 15 | 57.69 | - | - | - | - | |
| **Considering treatment** | Yes | 10 | 9.09 | 8 | 30.77 | 14 | 66.67 | 7 | 87.50 | <0.001 |
| | No | 9 | 90.91 | 18 | 69.23 | 7 | 33.33 | 1 | 12.50 | |
| **Doctoral program** | Prosthodontics | 6 | 54.55 | 14 | 53.85 | 4 | 19.05 | 4 | 50.00 | 0.260 |
| | Periodontology | 1 | 9.09 | 4 | 15.38 | 7 | 33.33 | 7 | 12.50 | |
| | Endodontics/restorative dentistry | 2 | 18.18 | 3 | 11.54 | 2 | 9.52 | 2 | 25.00 | |
| | Oral and maxillofacial surgery | 2 | 18.18 | 5 | 19.23 | 8 | 38.10 | 8 | 12.50 | |
| **Year of graduate study** | <2 | 6 | 54.55 | 15 | 57.69 | 11 | 52.38 | 1 | 12.50 | 0.159 |
| | >2 | 5 | 45.45 | 11 | 42.31 | 10 | 47.62 | 7 | 87.50 | |
| **Hours worked per day** | 9 hours | 7 | 63.64 | 16 | 61.54 | 11 | 52.38 | 4 | 50.00 | 0.506 |
| | 9-12 hours | 1 | 9.09 | 7 | 26.92 | 7 | 33.33 | 1 | 12.50 | |
| | 12+ | 3 | 27.27 | 3 | 11.54 | 3 | 14.29 | 3 | 37.50 | |

Fisher exact test, TMD: Temporomandibular joint dysfunction, TMJ: Temporomandibular joint

have used the Fonseca Anamnestic Questionnaire to examine the prevalence of TMJ disorders have reported varying results. In this study, TMD ranging from mild to severe was observed in 284 out of 407 participants (70%). This rate is consistent with the prevalence reported in studies conducted among the Turkish population and among students from different faculties of dentistry, which ranges between 42% and 68%.[16,19-21]

When considering the gender, the proportion of females with severe TMD (96.77%) was significantly higher compared to males (3.23%) (p<0.001). This finding aligns with other studies in the literature, which generally report a higher frequency and severity of TMD in female patients than in males.[22-24] A systematic review and meta-analysis by Bueno et al.[25] indicated that females are more prone to developing TMD, potentially due to hormonal, cultural, and social

factors, high stress in work environments, and variations in pain sensitivity. The prevalence of major depression is also higher in females than in males.[26] Although the etiology of TMD is multifactorial, depression and stress are among the contributing factors,[27] which may help explain the observed gender differences.

In analyses conducted by class level, a significant association was found between class level and TMD (p=0.023). However, this difference was attributed to graduate students, as moderate TMD (26.25%) and severe TMD (25.81%) levels were significantly higher among graduate students compared to the no TMD group (8.94%). In a study by Ahuja et al.,[28] graduate students reported higher stress levels due to personal and clinical factors compared to undergraduate students. Variables such as academic workload, clinical duties, financial responsibilities, and career planning are reported as stress sources among graduate students, which may explain the higher prevalence of TMD observed in this group. Further analysis among graduate students also revealed that the rate of severe TMD was higher, especially among those in their studies for more than two years (87.5%), compared to those in their first two years (12.5%). This finding suggests an increased prevalence of TMD among students in the latter half of their doctoral studies, likely due to the academic pressure and concerns about the future that intensify as the doctoral process progresses.

Severe TMD was observed in 12.12% of graduate students. Among those with severe TMD, 50% worked 9 hours per day, 12.50% worked 9-12 hours, and 37.50% worked more than 12 hours daily. Of the participants with moderate and mild TMD, 52.38% and 61.54%, respectively, worked 9 hours per day, while 14.29% and 11.54% worked more than 12 hours per day. The literature indicates that factors such as long hours at the computer and poor posture are associated with TMD.[29] However, the findings from this study did not establish a significant association between increased working hours and the prevalence of TMD.

Among participants with severe TMD, 54.84% lived alone, while 45.16% lived with family. In contrast, among participants without TMD symptoms, 52.03% lived alone, and 47.97% lived with family. These results indicate no significant difference between living arrangements and TMD presence (p=0.098). However, the literature suggests that family support and social environment factors may help reduce stress,[10] warranting further investigation into this topic.

In the assessment of TMD awareness, the majority of participants across all TMD severity groups and the non-TMD group responded "yes" to the question, "Do you have any knowledge about TMJ and muscle disorders?" Awareness was highest in the non-TMD group (98.37%), followed by the severe TMD (90.32%) and moderate TMD (62.50%) groups. The group with the lowest awareness level was those with mild TMD. These findings are not unexpected, considering that TMD symptoms, pain thresholds, and adaptation mechanisms vary from person to person. Additionally, mild TMD symptoms may change over time and may sometimes remain asymptomatic for extended periods. Nevertheless, based on the analysis results, TMD awareness level was found to be statistically significant in relation to TMD severity (p<0.001).

Among participants with severe TMD, 70.97% expressed a willingness to undergo treatment, while 29.03% answered "no" to this question. In contrast, 63.58% of participants with mild TMD were not inclined to seek treatment. This result suggests that motivation for treatment is low when TMD severity is mild. However, delaying treatment may lead to an increase and frequency of TMD symptoms, potentially making the treatment more complex and prolonged.

The findings of this study indicate that TMD prevalence is high among dentistry students and that awareness levels need to be increased. However, TMD generally presents with mild to moderate severity. This condition, which is especially more prevalent among female and graduate students, highlights the need for ergonomic awareness training and the development of stress management strategies during the dental education process.[30]

### Limitations

This study was administered solely among undergraduate and graduate students of the Faculty of Dentistry at Başkent University, which limits the generalizability of the results to a broader student population. Additionally, the number of graduate students included in the study is significantly lower than that of undergraduate students, which may have influenced the results.

The research is cross-sectional, meaning it only reflects the TMD status of participants at a specific point in time. Consequently, it does not provide information on the development and progression of TMD over time. Long-term follow-up studies could be beneficial for a better understanding of the developmental process and trends of TMD.

Although the Fonseca Anamnestic Questionnaire used in this study is considered a valid and reliable tool for assessing TMD symptoms, it relies on subjective evaluations and is not supported by clinical examination. The data obtainable from survey studies for TMD detection are quite limited. Based on the information gathered, clinical and radiographic examinations are necessary for participants exhibiting TMD symptoms to confirm a TMD diagnosis.

## CONCLUSION

The study found that TMD prevalence is significantly higher in female students compared to male students.

Analysis between undergraduate and graduate students indicated that TMD severity was higher among students in advanced academic years.

In evaluations conducted among graduate students, the rate of severe TMD was found to be higher among those who had been in their program for more than two years compared to those in their first two years.

Participants with knowledge about TMJ and muscle disorders were more aware of TMD symptoms and were more frequently found in the severe TMD group.

## ETHICAL DECLARATIONS

### Ethics Committee Approval

The study was carried out with the permission of by the Ethics Committee for Clinical Researches of Başkent University (Date: 22.11.2024, Decision No: 24/229).

## Informed Consent

All patients signed and free and informed consent form.

## Referee Evaluation Process

Externally peer-reviewed.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

## Financial Disclosure

The authors declared that this study has received no financial support.

## Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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